

## Section 4.1

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$$2.) \text{ a.) } \left(\frac{1}{5}\right)^3 = \frac{1^3}{5^3} = \frac{1}{125}$$

$$\text{b.) } \left(\frac{1}{8}\right)^{\frac{1}{3}} = \frac{1^{\frac{1}{3}}}{8^{\frac{1}{3}}} = \frac{1}{2}$$

$$\text{c.) } (64)^{\frac{2}{3}} = (64)^{\frac{1}{3} \cdot 2} = (4)^2 = 16$$

$$\text{d.) } \left(\frac{5}{8}\right)^2 = \frac{5^2}{8^2} = \frac{25}{64}$$

$$\text{e.) } 100^{\frac{3}{2}} = 100^{\frac{1}{2} \cdot 3} = (10)^3 = 1000$$

$$\text{f.) } 4^{\frac{5}{2}} = 4^{\frac{1}{2} \cdot 5} = (2)^5 = 32$$

$$4.) \text{ a.) } \frac{5^3}{5^6} = 5^{3-6} = 5^{-3} = \frac{1}{5^3} = \frac{1}{125}$$

$$\text{b.) } \left(\frac{1}{5}\right)^{-2} = \frac{1^{-2}}{5^{-2}} = \frac{1}{\frac{1}{5^2}} = 5^2 = 25$$

$$\text{c.) } (8^{\frac{1}{2}})(2^{\frac{1}{2}}) = (8 \cdot 2)^{\frac{1}{2}} = 16^{\frac{1}{2}} = 4$$

$$\begin{aligned} \text{d.) } (32^{\frac{3}{2}})\left(\frac{1}{2}\right)^{\frac{3}{2}} &= \left(32 \cdot \frac{1}{2}\right)^{\frac{3}{2}} = 16^{\frac{3}{2}} \\ &= (16^{\frac{1}{2}})^3 = 4^3 = 64 \end{aligned}$$

$$6.) \text{ a.) } (4^3)(4^2) = 4^{3+2} = 4^5 = 1024$$

$$\text{b.) } \left(\frac{1}{4}\right)^2 \cdot (4^2) = \frac{1}{16} \cdot 16 = 1$$

$$\text{c.) } (4^6)^{\frac{1}{2}} = 4^3 = 64$$

$$d.) [(8^{-1})(8^{2/3})]^3 = [8^{-1+2/3}]^3 \\ = [8^{-1/3}]^3 = 8^{-1} = \frac{1}{8}$$

$$8.) f(x) = 3^{x+2}$$

$$a.) f(-4) = 3^{-4+2} = 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$$

$$b.) f(-\frac{1}{2}) = 3^{-\frac{1}{2}+2} = 3^{3/2}$$

$$c.) f(2) = 3^{2+2} = 3^4 = 81$$

$$d.) f(-\frac{5}{2}) = 3^{-\frac{5}{2}+2} = 3^{-1/2} = \frac{1}{3^{1/2}} = \frac{1}{\sqrt{3}}$$

$$12.) 5^{x+1} = 125 \rightarrow 5^{x+1} = 5^3 \rightarrow \\ x+1 = 3 \rightarrow x = 2$$

$$13.) \left(\frac{1}{3}\right)^{x-1} = 27 \rightarrow \left(\frac{1}{3}\right)^{x-1} = 3^3 \rightarrow \\ (3^{-1})^{x-1} = 3^3 \rightarrow 3^{-x+1} = 3^3 \rightarrow -x+1 = 3 \rightarrow \\ x = 1-3 \rightarrow x = -2$$

$$14.) \left(\frac{1}{5}\right)^{2x} = 625 \rightarrow (5^{-1})^{2x} = 5^4 \rightarrow \\ 5^{-2x} = 5^4 \rightarrow -2x = 4 \rightarrow x = -2$$

$$18.) (x+3)^{4/3} = 16 \rightarrow (x+3)^{4/3 \cdot 3/4} = 16^{3/4} \rightarrow \\ x+3 = (16^{3/4})^3 \rightarrow x+3 = 2^3 = 8 \rightarrow x = 5$$

19.) (e)

20.) (c)

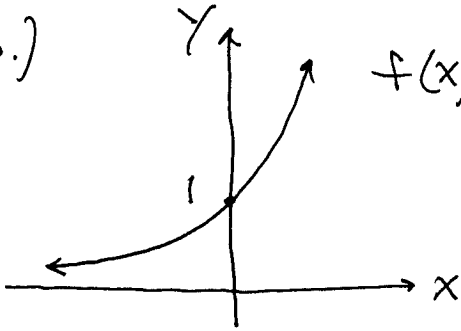
21.) (a)

22.) (f)

23.) (d)

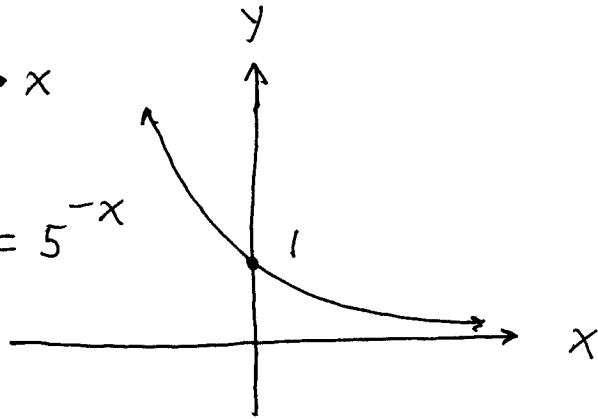
24.) (b)

26.)  $f(x) = 4^x$



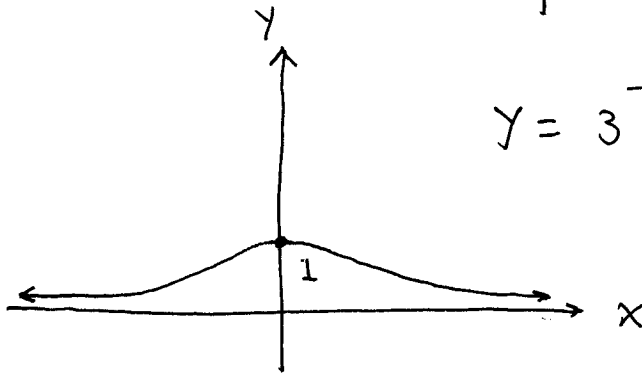
27.)

$f(x) = 5^{-x}$



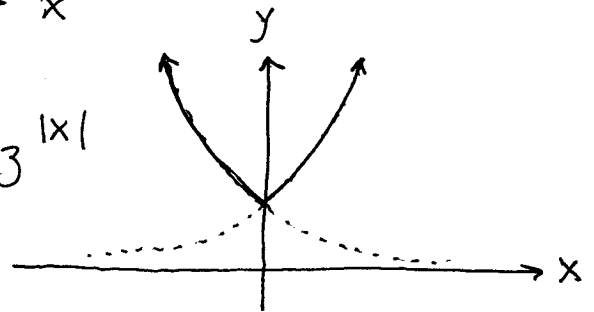
29.)

$y = 3^{-x^2}$



32.)

$y = 3^{|x|}$



35.)  $P(t) = 251.27 (1.0118)^t$

a.) 2006 ( $t=16$ )  $\rightarrow P(16) = 251.27 (1.0118)^{16}$   
 $\approx 303.15$  million

b.) 2012 ( $t=22$ )  $\rightarrow P(22) = 251.27 (1.0118)^{22}$   
 $\approx 325.25$  million

$$37.) \quad V = 64,000 (2)^{t/15}$$

$$a.) \quad V(5) = 64,000 (2)^{5/15} \approx \$80,634.95$$

$$b.) \quad V(20) = 64,000 (2)^{20/15} \approx \$161,269.89$$

39.) t      value V

$$0 \quad 16,000$$

$$1 \quad 16,000 \left(\frac{3}{4}\right)$$

$$2 \quad 16,000 \left(\frac{3}{4}\right)\left(\frac{3}{4}\right) = 16,000 \left(\frac{3}{4}\right)^2$$

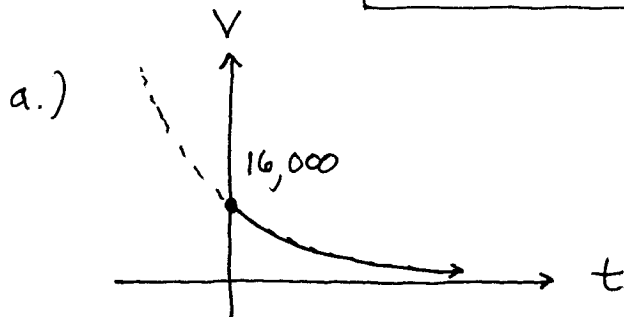
$$3 \quad 16,000 \left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{3}{4}\right) = 16,000 \left(\frac{3}{4}\right)^3$$

$$4 \quad 16,000 \left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{3}{4}\right) = 16,000 \left(\frac{3}{4}\right)^4$$

⋮

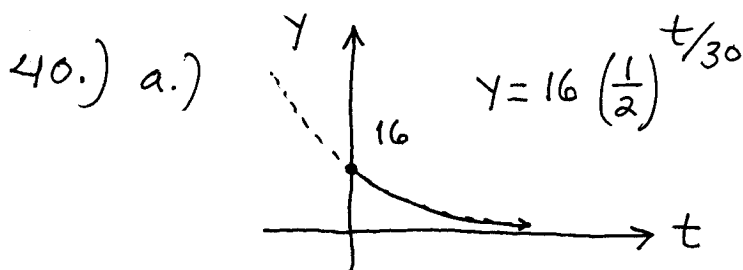
t

$$V = 16,000 \left(\frac{3}{4}\right)^t$$



$$b.) \quad V(4) = 16,000 \left(\frac{3}{4}\right)^4$$

$$\approx \$5062.50$$



$$b.) \quad Y(50) = 16 \left(\frac{1}{2}\right)^{50/30}$$

$$\approx 5.04 \text{ grams}$$

## Handout 1

$$\begin{aligned} 1.) \quad A &= P\left(1 + \frac{r}{n}\right)^{nt} \rightarrow 1200 = 500 \left(1 + \frac{r}{365}\right)^{365(8)} \rightarrow \\ \frac{12}{5} &= \left(1 + \frac{r}{365}\right)^{2920} \rightarrow \left(\frac{12}{5}\right)^{\frac{1}{2920}} = \left(1 + \frac{r}{365}\right)^{2920 \cdot \frac{1}{2920}} \rightarrow \\ 1 + \frac{r}{365} &= \left(\frac{12}{5}\right)^{\frac{1}{2920}} \rightarrow r = 365 \left[ \left(\frac{12}{5}\right)^{\frac{1}{2920}} - 1 \right] \\ &= 0.10945 = 10.945\% \end{aligned}$$

$$\begin{aligned} 2.) \quad A &= P\left(1 + \frac{r}{n}\right)^{nt} \rightarrow 5200 = 1000 \left(1 + \frac{0.035}{1}\right)^{1 \cdot t} \rightarrow \\ 5.2 &= 1.035^t \rightarrow \ln 5.2 = \ln 1.035^t \rightarrow \\ \ln 5.2 &= t \ln 1.035 \rightarrow t = \frac{\ln 5.2}{\ln 1.035} \approx 47.9 \text{ yrs.} \end{aligned}$$

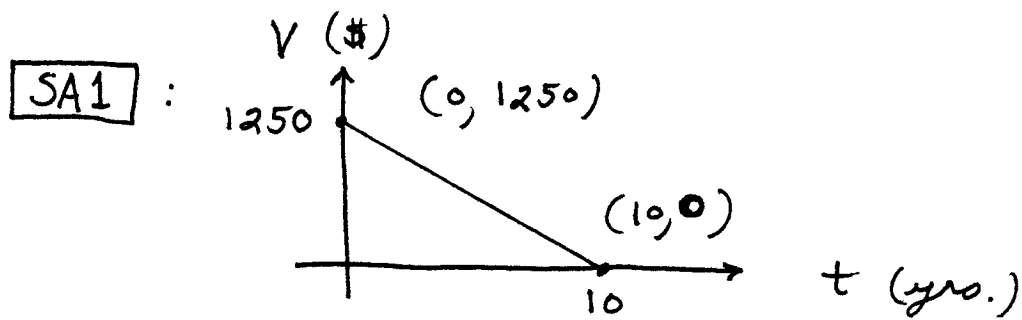
$$\begin{aligned} 3.) \quad A &= Pe^{rt} \rightarrow 12,850 = Pe^{(0.055)(3)} \rightarrow \\ P &= \frac{12,850}{e^{0.165}} \approx \$10,895.43 \end{aligned}$$

$$\begin{aligned} 4.) \quad A &= Pe^{rt} \rightarrow 20,000 = 2000 e^{0.12t} \rightarrow 10 = e^{0.12t} \rightarrow \\ \ln 10 &= \ln e^{0.12t} \rightarrow \ln 10 = 0.12t \rightarrow t = \frac{\ln 10}{0.12} \approx 19.2 \text{ yrs.} \end{aligned}$$

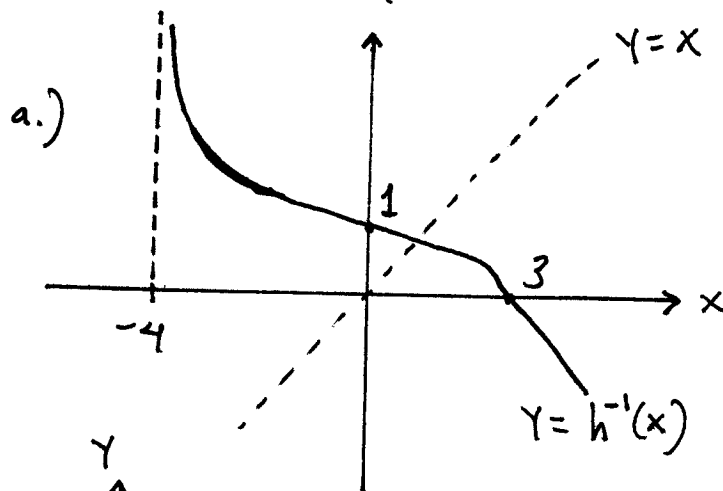
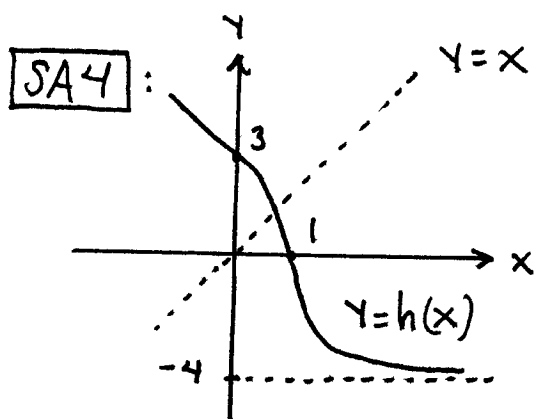
$$5.) \text{ account A: } A = Pe^{rt} = 50,000 e^{0.0575t}$$

$$\text{account B: } A = P\left(1 + \frac{r}{n}\right)^{nt} = 50,000 \left(1 + \frac{0.058}{1}\right)^{1 \cdot t}$$

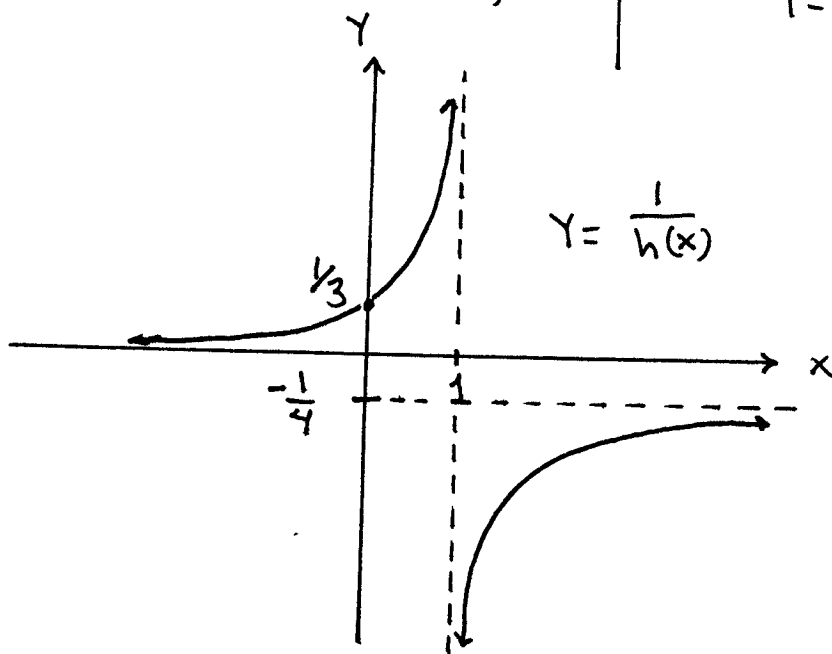
	5 yrs.	50 yrs.	75 yrs.
account A	\$66,654.53	\$886,271.21	\$3,731,341.15
account B	\$66,282.42	\$838,018.08	\$3,430,797.50
Difference	\$372.11	\$48,253.13	\$300,543.65



slope :  $\frac{1250 - 0}{0 - 10} = -125$  so value of refrigerator after  $t$  years is  $V = -125t + 1250$  ; so current value ( $t = 3$  yrs.) is  $V = \$875$



b.)



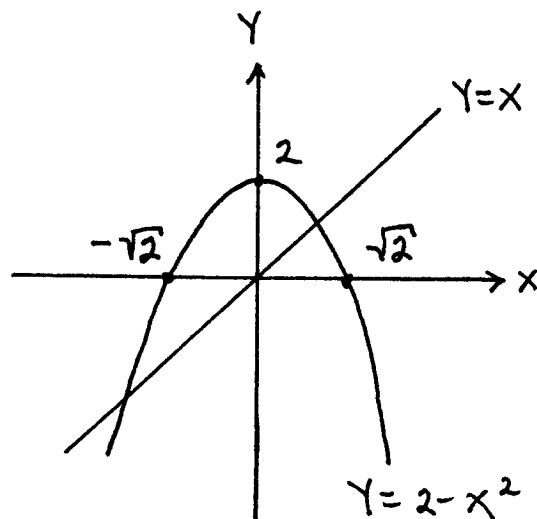
SA7 a.)  $Y=X, Y=2-X^2$

intersection :

$$X=2-X^2 \rightarrow X^2+X-2=0 \rightarrow (X-1)(X+2)=0 \rightarrow$$

$$X=1, Y=1 \quad \text{and}$$

$$X=-2, Y=-2$$

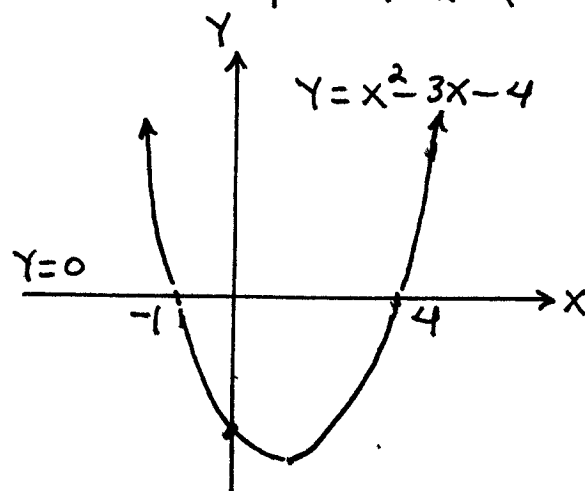


b.)  $Y=0, Y=X^2-3X-4$   
 $= (X-4)(X+1)$

intersection :

$$0 = (X-4)(X+1) \rightarrow$$

$$X=4, Y=0 \quad \text{and} \quad X=-1, Y=0$$



c.)  $Y=X^2-4X+3, Y=-X^2+2X+3$   
 $= (X-1)(X-3), = -(X-3)(X+1)$

intersection :

$$X^2-4X+3 = -X^2+2X+3$$

$$\rightarrow 2X^2-6X = 0$$

$$\rightarrow 2X(X-3) = 0$$

$$\rightarrow X=0, Y=3 \quad \text{and}$$

$$X=3, Y=0$$

